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(54) Lock and seal assembly actuated by expansion of intumescent material

(57) A heat activatable seal assembly for providing, on activation, a seal between opposed first and second relatively movable members such as doors 12, the assembly including a locking latch member 32 movably mounted in a housing mounted on the first movable member for movement between a retracted position shown and an extended position whereat it projects from the first movable member to mechanically lockingly engage with a latch receiving member in the form of a cavity 41 mounted on the second movable member, and intumescent material 34 located between the latch member and the housing which on intumescence expands to move the latch member to its extended position.

The cavity 41 preferably contains a sacrificial plastics sealing member 50 which melts on heating. Intumescent material is preferably located behind a movable retention member in the cavity 41.

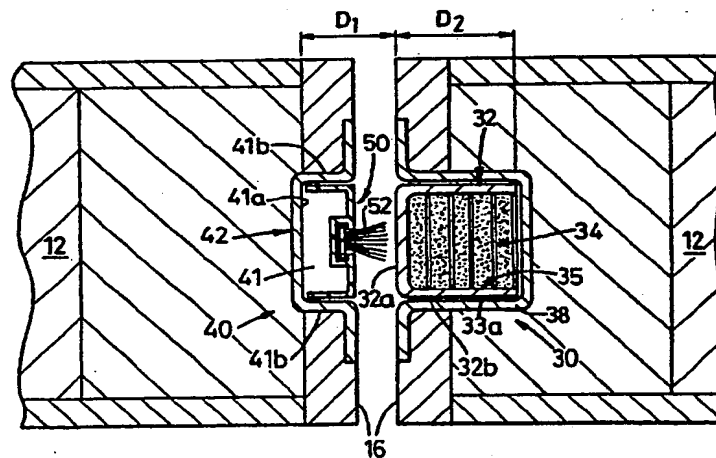


Fig. 3

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

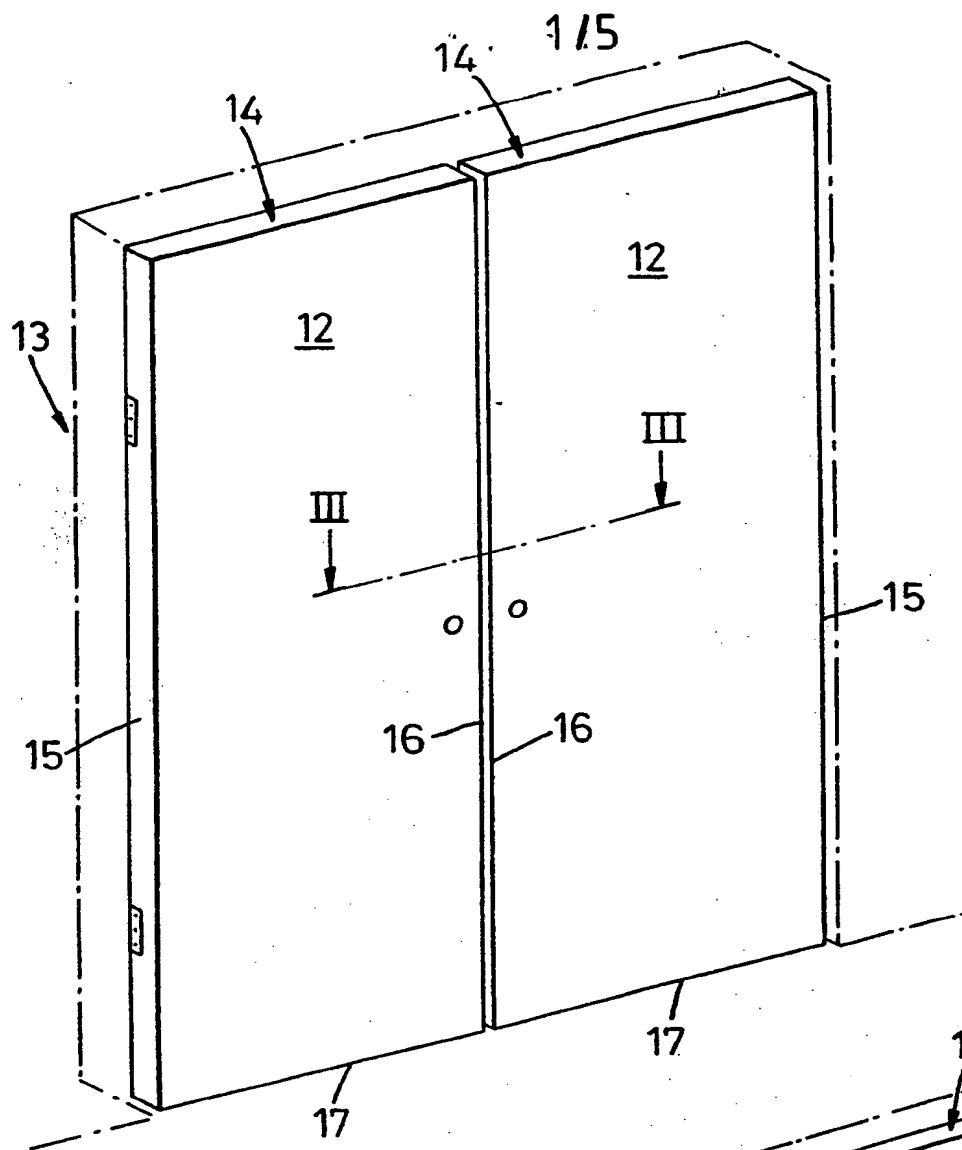
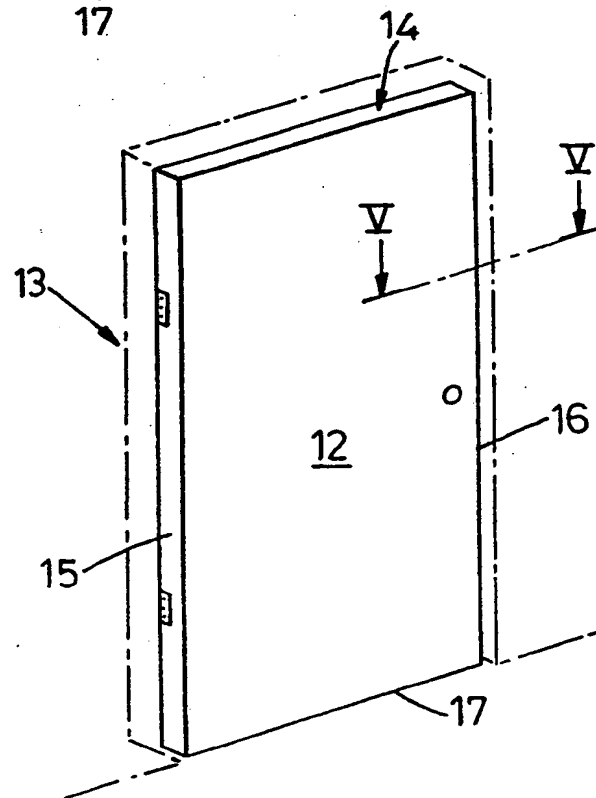


Fig. 1

Fig. 2



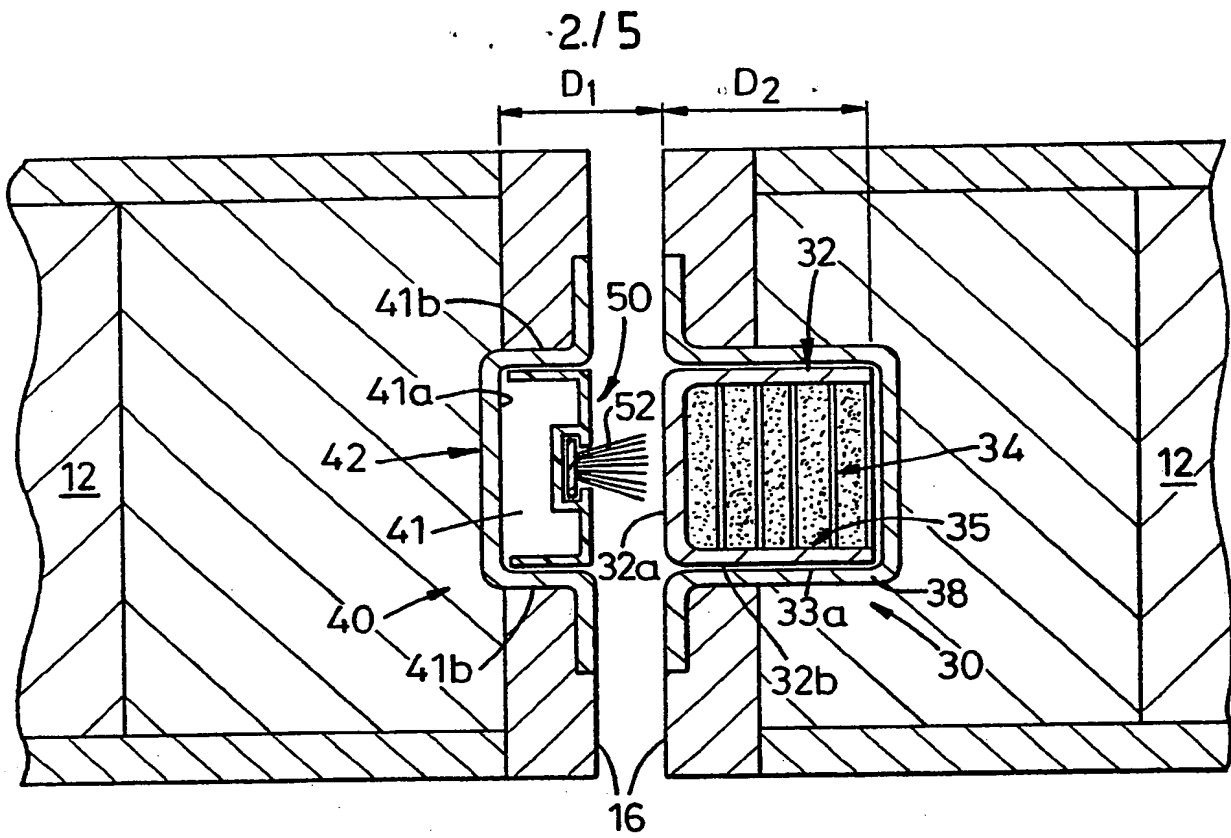


Fig. 3

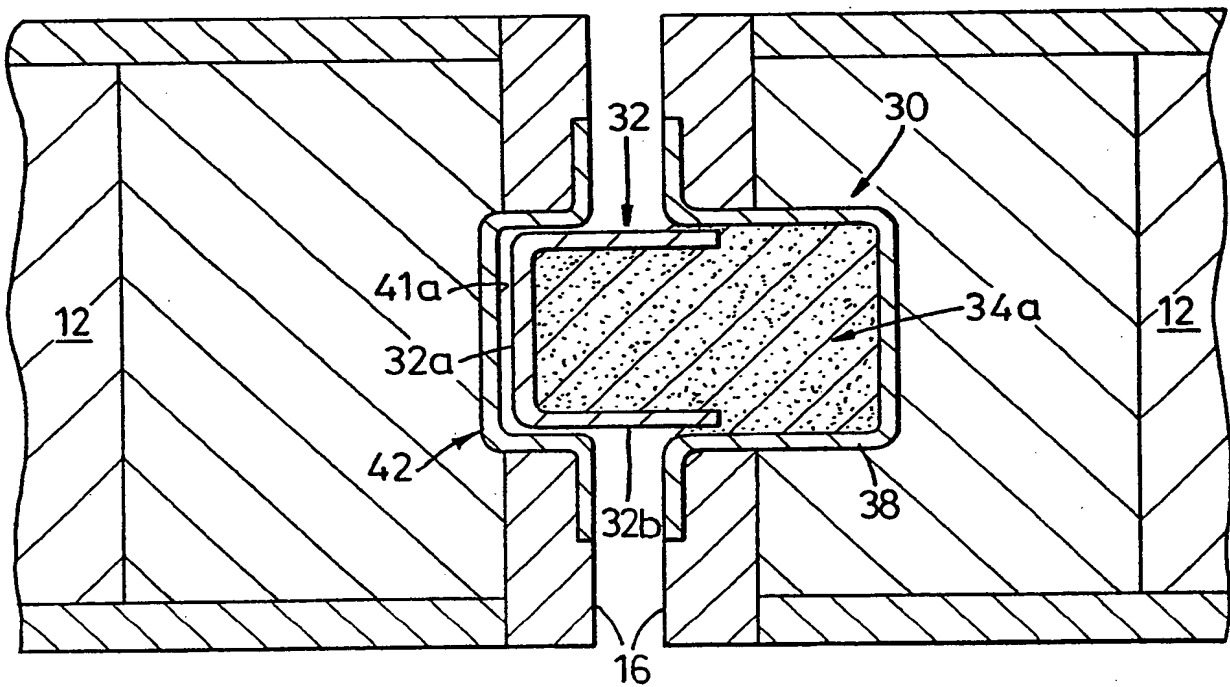
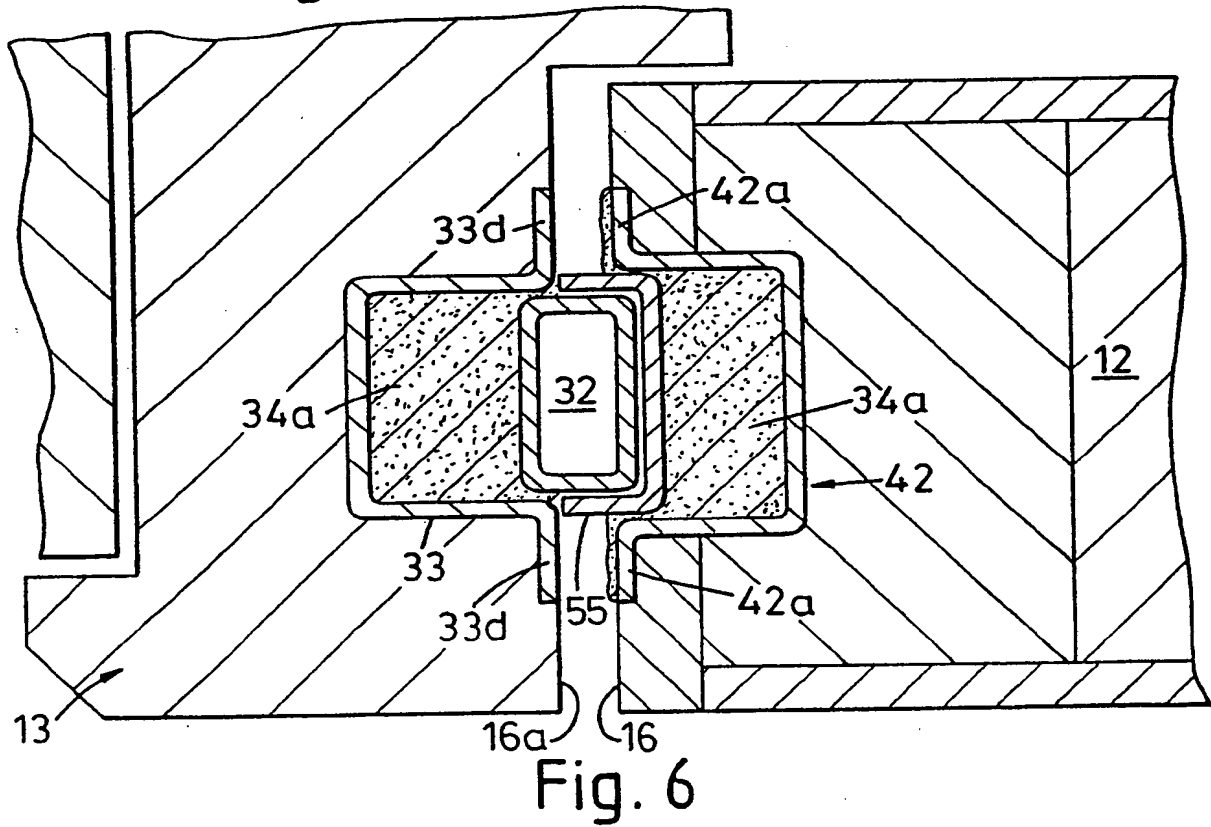
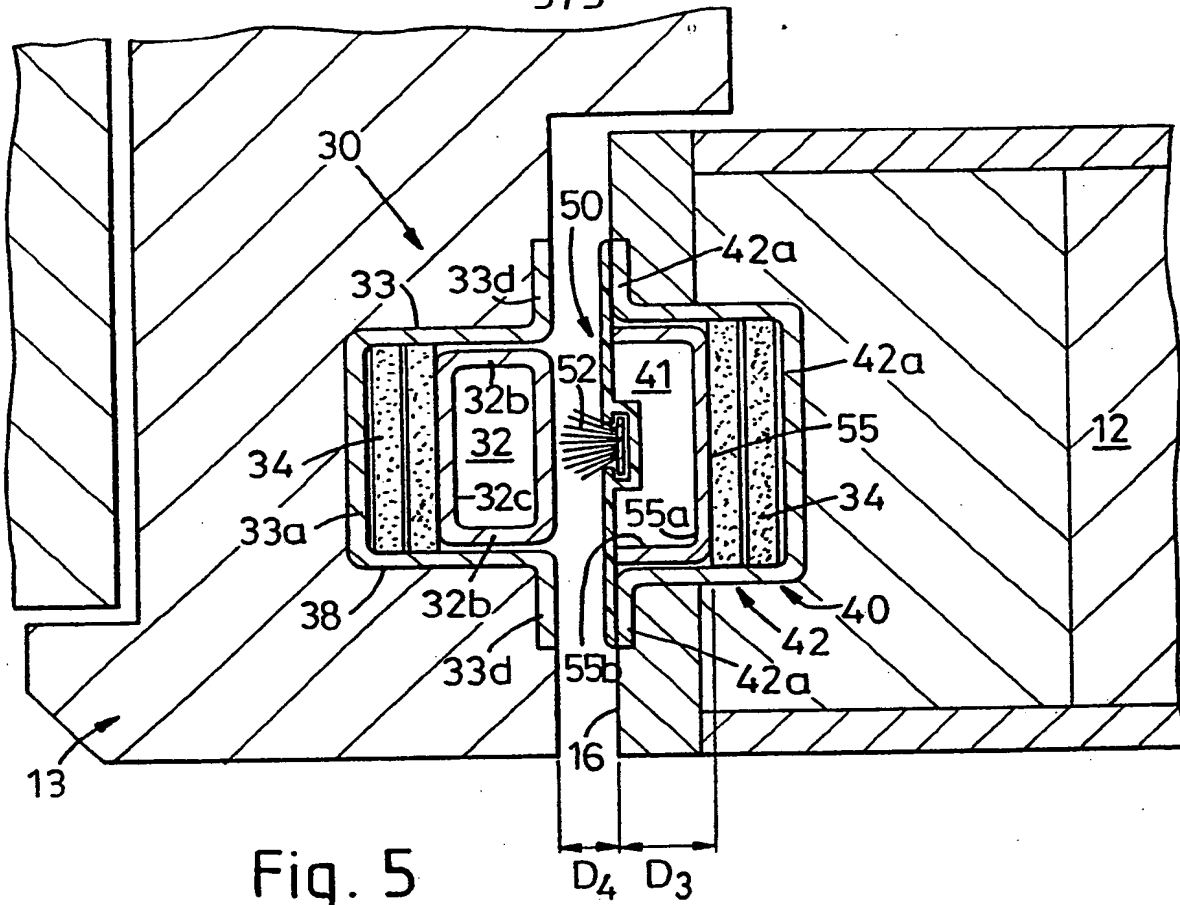


Fig. 4



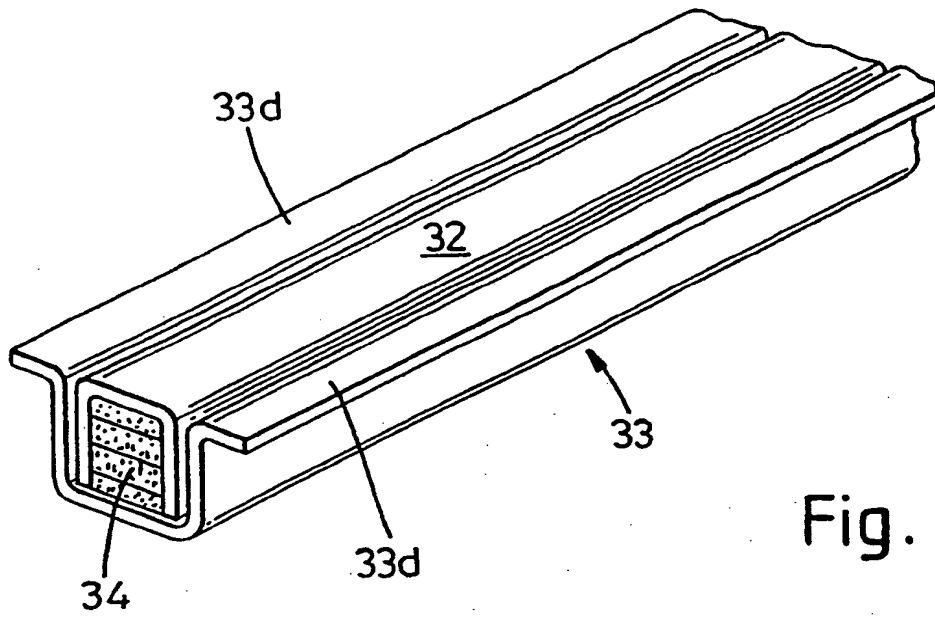


Fig. 7

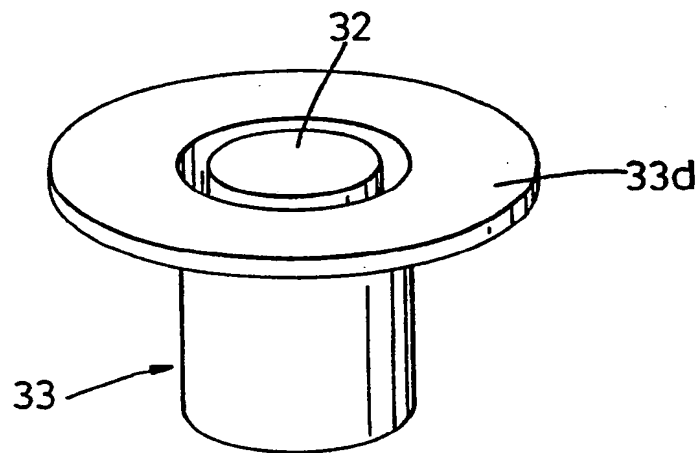


Fig. 8

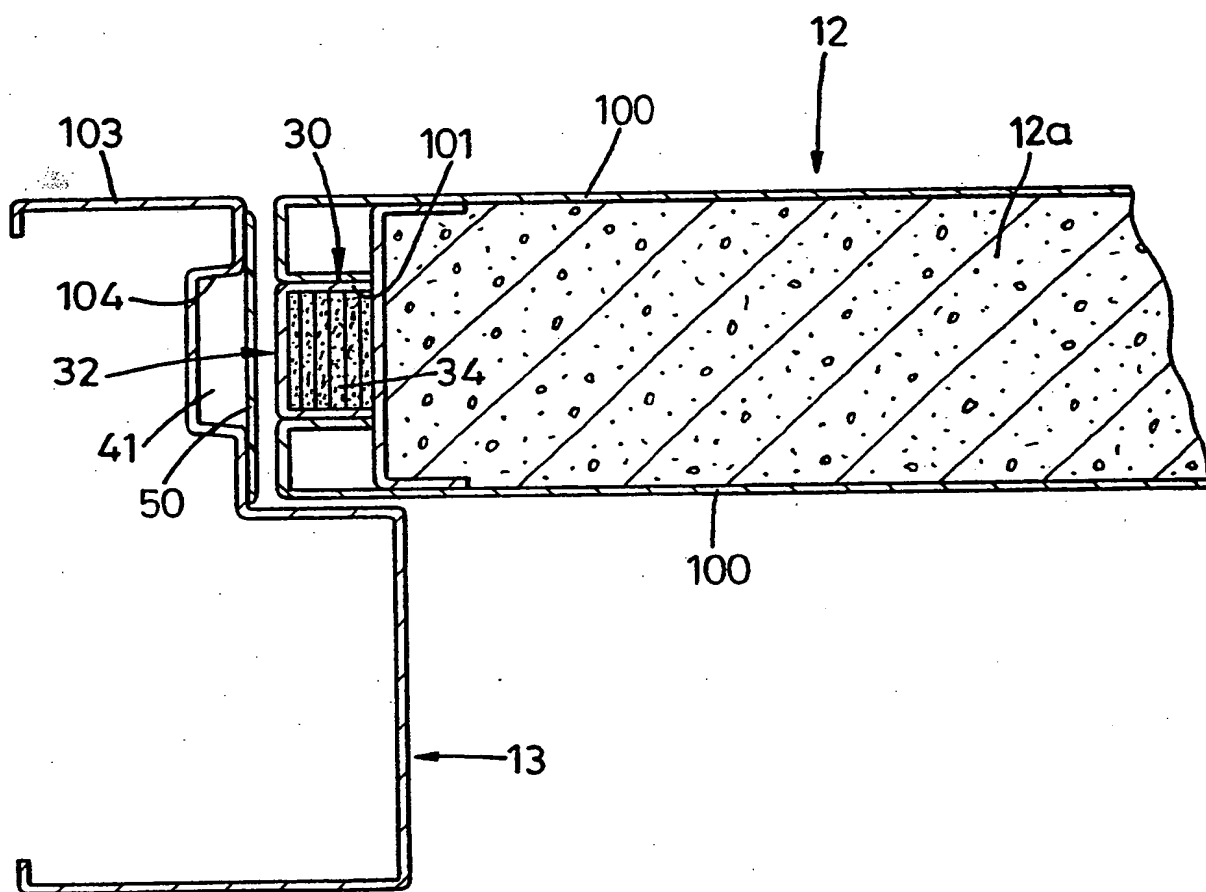


Fig. 9

LOCK AND SEAL ASSEMBLY

The present invention relates to a heat activatable lock assembly.

5 It is known to provide intumescent seals around the periphery of doors, for example internal doors in buildings, which under fire conditions intumesce to fill gaps between the door and surrounding frame to provide a smoke seal. Undesirably, movement of the door due to distortion of the door caused by the effect of fire and/or vibration caused by air pressure shocks, can cause the seal provided by the intumescent material to be
10 broken and thereby lead to premature failure.

The present invention is primarily concerned with providing a lock or seal assembly which can be arranged around the periphery of the door and which under fire conditions is activated to provide a positive mechanical
15 lock between the door and its surround. In such a case the door is securely held to resist distortion and is also secured against movement caused by air pressure shocks. The assembly may itself provide both a seal and mechanical lock between the door and its surround or may provide a mechanical lock only and be supplementary to a separate seal.

20

According to one aspect of the invention there is provided a heat activatable seal assembly for providing, on activation, a seal between opposed first and second relatively movable members, the assembly including a locking latch member movably mounted in a housing mounted
25 on the first movable member for movement between a retracted position and an extended position whereat it projects from the first movable member to mechanically lockingly engage with a latch receiving member mounted on the second movable member, and intumescent material located between the latch member and the housing which on intumescence expands
30 to move the latch member to its extended position.

According to another aspect of the present invention there is provided a heat activatable lock assembly including a locking latch member movably mounted in a housing for movement between a retracted position and an extended position whereat it projects from said housing, and intumescent material located between the latch member and the housing which on intumescence expands to move the latch member from its retracted to its extended position.

Preferably the housing and/or the latch member is made from a heat conductive material for promoting intumescence of the intumescent material. Preferably the heat conductive material is a metal which has a melting point above 800°C, such as for example copper, brass or steel.

In one embodiment, the housing is defined by an elongate U-shaped channel and the latch member is defined by an elongate bar member located in the channel. The bar member may be solid or hollow in cross-section.

According to another aspect of the present invention there is provided a door mounted in a door surround and a lock assembly as defined above mounted to provide, on activation, a mechanical lock between a peripheral edge of the door and a portion of the surround facing said peripheral edge.

In one embodiment the lock assembly may be elongate in a direction perpendicular to the direction of movement between the retracted and extended positions. Such a lock assembly is preferably arranged to extend along the peripheral edge of the door in order to provide a seal and a mechanical lock along a substantial portion of the peripheral edge.

Alternatively, in another embodiment the lock assembly may be elongate

in the direction of movement between the retracted and extended positions. With this embodiment it is envisaged that several lock assemblies are provided, spaced along the peripheral edge of the door.

- 5 Various aspects of the present invention are hereinafter described with reference to the accompanying drawings, in which:-

Figure 1 is a schematic illustration of a door and surround assembly according to one embodiment of the present invention;

- 10 Figure 2 is a schematic illustration of a door and surround assembly according to another embodiment of the present invention;

Figure 3 is a partial section along line III-III in Figure 1 showing a lock assembly according to one embodiment of the present invention;

Figure 4 is a view similar to Figure 3 showing the embodiment after fire activation;

- 15 Figure 5 is a partial section along line V-V in Figure 2 showing a lock assembly according to another embodiment of the present invention;

Figure 6 is a view similar to Figure 5 showing the embodiment after fire activation;

- 20 Figure 7 is a perspective view of a lock assembly as shown in Figure 3 which is of elongate form in the direction perpendicular to movement of the latch;

Figure 8 is a perspective view of an alternate lock assembly which is of elongate form in the direction of movement of the latch;

- 25 Figure 9 is a view similar to Figure 5 of a modified door and surround construction.

In Figure 1 there is shown a pair of doors 12 mounted on a door surround 13.

- 30 Each door 13 has an upper peripheral edge 14, a pair of side peripheral

edges 15,16 and a lower peripheral edge 17.

The upper and side peripheral edges 14 and 15 respectively of each door face the door surround and the side peripheral edges 16 of each door 12 face one another.

In Figure 2 there is shown a single door 12 mounted in a door surround 13. In the case of the single door assembly as shown in Figure 2, both peripheral side edges 15, 16 and the upper edge 14 face the surround 13.

In the door assemblies of Figure 1 or 2, the doors 12 may be hinged so as to be of the single swing or double swing type.

In accordance with the present invention heat activatable lock assemblies 30 are provided along at least the upper peripheral edge 14 and side edges 16.

The heat activatable lock assembly 30 illustrated in Figure 3 includes a latch member 32 mounted in a housing 33 for movement between a retracted position (as shown in Figure 3) and an extended position (as shown in Figure 4).

The latch member 32 shown in Figure 3 has an open hollow cross-section defining a hollow casing 35 which is filled with an intumescent material 34.

Under fire conditions, the intumescent material 34 intumesces and expands to form a hard foamed mass 34a. During expansion of the intumescent

material, the latch member 32 is moved to its extended position as shown in Figure 4.

5 The lock assembly 30 further includes a latch retention formation 40 in the form of a cavity 41 opposed to the latch member 32 so that when the latch member 32 moves to its extended position it enters the cavity 41 and is thereafter restrained against lateral displacement.

10 The cavity 41 may be formed directly in the material at the edge of the door, or as shown, preferably is formed by a casing 42 which is recessed into the edge of the door.

The intumescent material and dimensions of the latch member/ retention formation are preferably chosen such that on intumescence of the
15 intumescent material, the latch member 32 is moved to project out of the housing 33 by a sufficient distance for its end wall 32a to engage the bottom wall 41a of cavity 41. The length D_1 of the casing 35 in the direction of movement between its retracted and extended positions is preferably chosen to be greater than the distance D_2 between the bottom
20 wall 41a of the cavity and the surface of opposed edge 16 containing the housing 33.

In this manner, when the latch member 32 is in its fully extended position, its casing 35 extends between housing 33 and casing 42 and thereby
25 provides a mechanical lock for restraining relative lateral displacement between housing 33 and casing 42.

Preferably as shown in Figure 3, when the latch member is in its fully retracted position, its end wall 32a is contiguous with the surface of edge
30 16. The spacing between the side walls 32b of the latch member 32 and

the opposed walls 33a of housing 33 is preferably chosen to be a minimum commensurate with permitting the latch member 32 to move readily to its extended position under the pressure generated by the intumescent material and with providing the desired amount of lateral restraint when the latch member 32 is in its fully extended position.

The cavity 41 is shown as having generally parallel side walls 41b spaced apart by a distance slightly greater than the width of the latch member 32. In order to facilitate entry of the latch member 32 into the cavity 41, it is envisaged that the side walls 41b may diverge away from one another at the mouth of the cavity in order to provide a widened mouth for guiding entry of the latch member 32 into the cavity. In addition, or as an alternative, it is envisaged that the side walls 41b may be spaced apart by a distance less than the width of the latch member 32 at a location inboard from the mouth of the cavity so that on entry of the latch member 32 into the cavity it wedgingly engages the casing 42. This may be achieved by disposing the side walls 41b such that they are inclined toward one another as they approach the bottom wall 41a.

Preferably the cavity 41 is closed by a sacrificial closure member 50 which serves to prevent ingress of dirt or other foreign bodies into the cavity prior to actuation of the locking assembly 30 under fire conditions.

The closure member 50 is preferably formed from a material, such as a low melting point plastics material, which under fire conditions is destroyed to permit unrestricted entry of the latch member 32 into the cavity 41. A suitable plastics material is polyvinylchloride. The closure member 50 may mount a projecting smoke seal 52 which can be in the form of a brush or unitary sealing blade.

An alternative arrangement is shown in Figures 5 and 6 wherein parts similar to those described in relation to Figures 1 to 4 have been given similar reference numerals.

- 5 In the embodiment of Figure 5 the latch member 32 has a closed cross-section with the intumescent material 34 being located inbetween the bottom wall 33_a of the housing 33 and end wall 32_c of the latch member 32. This arrangement may be adopted in the embodiment of Figure 3. In addition, in the embodiment of Figure 5 the cavity 41 is defined by a
- 10 movable retention casing 55 which is movably mounted in the casing 42 for movement in the retract - extend direction of the latch member 32. Intumescent material 34 is located between the bottom wall 55_a of casing 55 and bottom wall 42_a of casing 42. Accordingly, under fire conditions both the latch member 32 and retention casing 55 are moved toward one
- 15 another to respective extended positions by the intumescent material 34 as it intumesces to form a hard expanded foamed mass 34a.

Preferably the width of casing 55 is greater than the distance between side walls 32_b so that, as shown in Figure 6, when it is moved in its extend

20 direction it abuts against the surface of the opposed edge 16a of the surround 13 to limit further movement in the extend direction. The length D₃ of side walls 55_b is chosen to be greater than the distance D₄ between opposed faces of opposed edges 16, 16a so that when in its fully extended position, casing 55 remains partly housed within casing 42.

25

Similarly the length of side walls 32_b is chosen to be greater than the depth of casing 55 so that when the latch member 32 is at its fully extended position it remains partially housed within housing 33.

- 30 In all embodiments, the housing 33 and casings 35, 42 and 55 are each

preferably formed from a material having good heat conductive properties which under fire conditions remains rigid. Suitable materials are metals having a melting point above 800°C such as copper, brass or steel.

- 5 However, alternate heat conductive materials, not having such a high melting point, such as aluminium, aluminium alloys, or plastics/fibre reinforced composites, could be used.

- 10 Preferably housing 33 and/or casing 42 are provided with integral side flanges 33d, 42a respectively which extend toward the front and rear faces of the door 12.

- These flanges are preferred as they function as heat receptors for quickly collecting heat and conducting it to the remainder of the housing/casing
15 for activating the intumescent material.

In addition the latch member 32 of closed cross-section preferably has a hollow interior in order to reduce its heat capacity.

- 20 The intumescent material may be any conventional pressure generating intumescent material. Laminated strips of Palusol (RTM) are preferred.

- As indicated in Figures 7 and 8, the locking assemblies described above may either be of elongate form (as indicated in Figure 7) in a direction
25 perpendicular to the direction of movement of the latch member 32 between its retracted and extended positions or (as indicated in Figure 8) may be of elongate form in the direction of movement of the latch member between its retracted and extended positions.

- 30 The form shown in Figure 7 may be used to provide a continuous seal and

locking engagement along mutually facing surfaces and the form shown in Figure 8 may be used to provide localised locking engagement at discrete locations along the door edges.

- 5 Figure 9 illustrates an alternative embodiment as applicable to metal clad doors and surrounds.

In the Figure 9 embodiment, similar parts have been designated by similar reference numerals.

10

The door 12 includes a core construction 12a which is covered on its front and rear faces with a metal sheet 100. Each sheet 100 is folded at its periphery to form a channel 101 extending along one or more edges of the door. The channel 101 defines the housing 30 for the latch member 32.

- 15 The housing 30 is therefore formed integrally with the door 12.

Similarly, the surround 13 includes a metal sheet 103 folded to form the desired surround profile and also form an elongate channel 104 which defines the cavity 41.

20

It will be appreciated that the embodiment of Figure 5 may also be incorporated into the embodiment of Figure 9.

CLAIMS

1. A heat activatable seal assembly for providing, on activation, a seal between opposed first and second relatively movable members, the assembly including a locking latch member movably mounted in a housing
5 mounted on the first movable member for movement between a retracted position and an extended position whereat it projects from the first movable member to mechanically lockingly engage with a latch receiving member mounted on the second movable member, and intumescent material located between the latch member and the housing which on
10 intumescence expands to move the latch member to its extended position.
2. A seal assembly according to claim 1 wherein the housing and/or the latch member is made from a heat conductive material for promoting intumescence of the intumescent material.
- 15 3. A seal assembly according to claim 2 wherein the heat conductive material is a metal having a melting point above 800°C.
4. A seal assembly according to claim 1, 2 or 3 wherein the latch
20 member comprises a hollow body having an open side, the intumescent material being located within said hollow body so that on intumescence it passes through said open side to move the latch member to its extended position.
- 25 5. A seal assembly according to any preceding claim wherein the latch receiving member defines a cavity for receiving the latch member when in its extended position.
6. A seal assembly according to claim 5 wherein the cavity is formed
30 in a retention member movably mounted in a casing for movement in the

retract/extend direction of the latch member, intumescent material being located between the retention member and said casing which on intumescence moves the retention member toward said latch member.

5 7. A seal assembly according to claim 5 or 6 wherein the cavity is closed by a sacrificial closure member which under fire conditions permits unrestricted entry of the latch member into the cavity.

8. A seal assembly according to claim 7 wherein the closure member
10 is formed from a low melting point plastics material.

9. A seal assembly according to any of claims 5 to 8 wherein the closure member mounts a projecting smoke seal.

15 10. A seal assembly according to any preceding claim wherein the latch member, housing and latch receiving member are elongate in a direction perpendicular to the direction of movement of the latch member between the retracted and extended positions.

20 11. A seal assembly according to any of claims 1 to 9 wherein the latch member, housing and latch receiving member are elongate in the direction of movement of the latch member between the retracted and extended positions.

25 12. A seal assembly substantially as herein described with reference to and as illustrated in the accompanying drawings.

13. A door assembly including a seal assembly according to any of claims 1 to 12.

14. A heat activatable lock assembly including a locking latch member movably mounted in a housing for movement between a retracted position and an extended position whereat it projects from said housing, and intumescent material located between the latch member and the housing which on intumescence expands to move the latch member from its retracted to its extended position.
- 5



Application No: GB 9409837.3
Claims searched: 1 to 14

Examiner: Jim Calvert
Date of search: 11 July 1995

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK CI (Ed.N): E2A(ABA);E1J(JGN)
Int CI (Ed.6): E06B 5/16
Other: Online: WPI,EDOC

Documents considered to be relevant:

| Category | Identity of document and relevant passage | | Relevant to claims |
|----------|---|---|--------------------|
| A | GB2275491A | (N V TOOLS) Whole document | 1,14 |
| E,X | US5380053 | (F L SAINO) Whole document | 1-5, 11, 14 |
| X | FR2494347 | (APPAREILLAGES DELMO) See page 3, lines 6 to 14 | 1,14 |

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